Institute for Materials Science

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IMS Rapid Response 2016 * Phase I Recipient Seminar

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Efficient Workflows for Curation of Heterogeneous Data Supporting Modeling of U-Nb Alloy Aging

Wednesday, August 31, 2016
10:30 - Noon
Sig Hecker Conference Room (TA3 - 0032 room 134)

Abstract: Given prolonged thermal aging, the properties of materials can change dramatically. Materials that are normally ductile can become brittle and strong materials can become weak. Understanding how these aging processes occur and using that knowledge to predict how the material will perform often requires analyzing heterogeneous data types (e.g., micrographs, numerical values) from many different experiments – a process that requires significant, careful data curation and can be very time consuming. In this work, we explore how one can use modern data collection, storage, and analysis technologies to accelerate the development of aging models. In particular, we have developed software to store hardness data collected for uranium-niobium alloys over 70 years of research, and use automated data analysis tools to create models to predict how the hardness will change over time-at-temperature. In addition to providing the tools to accelerate model development, we also implemented methods for storing the rationale behind decisions made during the modeling process in order to enable better reproducibility. We envision that the techniques and software developed here can be used to accelerate the development of material property models for a variety of applications.

Bio: Logan is a Graduate Research Associate with the Sigma Division being supervised by Bob Hackenberg. He is also a PhD Candidate in Materials Science and Engineering at Northwestern University in the research group of Chris Wolverton. Before attending Northwestern, Logan earned a Bachelor's and Master's degree in Materials Science and Engineering from The Ohio State University in 2011 and 2012, respectively. The focus of Logan's dissertation research is the use of machine learning and other tools from data science in the development of new materials. In particular, he has employed machine learning algorithms to predict the results of Density Functional Theory (DFT) calculations and to design new metallic glass alloys. Another major focus of his thesis is to implement software that simplify developing and using machine learning models of material properties.

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Hosted Alexander Balatsky * Director of the Institute for Materials Science

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